Homework ch2

%% Question 1

t = [3.4935;4.2853;5.1374;5.8181;6.8632;8.1841];

x = [6;10.1333;14.2667;18.4;22.5333;26.6667];

% organize G

G = [ones(6,1),x];

% least square estimate s2

s2 = inv(G'\*G)\*G'\*t;

t\_pred = G\*s2;

% plot the data and the fitted model, and the residuals.

figure(1)

subplot(1,2,1)

plot(x,t,'LineWidth',1.5)

hold on

plot(x,t\_pred,'o','MarkerSize',8)

xlabel('Distance (m)')

legend('Observed','Predicted')

ylabel('Time (s)')

xlim([5,30])

set(gca,'fontsize',14)

title('Data')

subplot(1,2,2)

plot(x,t\_pred-t,'o','MarkerSize',8)

xlabel('Distance (m)')

ylabel('Time (s)')

xlim([5,30])

set(gca,'fontsize',14)

title('Residuals')

Question 2

%% Question 2

sigma = 0.1;

% define weight matrix

W = 1/sigma \* eye(6,6);

Gw = W\*G;

dw = W\*t;

s2w = inv(Gw'\*Gw)\*Gw'\*dw;

t\_pred = G\*s2;

% plot the data and the fitted model, and the residuals.

figure(2)

subplot(1,2,1)

plot(x,t,'LineWidth',1.5)

hold on

plot(x,t\_pred,'o','MarkerSize',8)

xlabel('Distance (m)')

legend('Observed','Predicted')

ylabel('Time (s)')

xlim([5,30])

set(gca,'fontsize',14)

title('Data')

subplot(1,2,2)

plot(x,t\_pred-t,'o','MarkerSize',8)

xlabel('Distance (m)')

ylabel('Time (s)')

xlim([5,30])

set(gca,'fontsize',14)

title('Residuals')

Question 3

%% Question 3

chi2 = (G\*s2 - t)'\*(G\*s2 - t)./sigma^2

chi2w = (W\*(G\*s2w - t))'\*(W\*(G\*s2w - t))

Question 4

%% Question 4 Evaluate the p-value for this model.

p = 1-chi2cdf(chi2,4)

pw = 1-chi2cdf(chi2w,4)